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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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CEPHALEUROS VIRESCENS ON CINCHONA IN CENTRAL AND SOUTH AMERICA

Bowen S. Crandall[1] and William C. Davis[1]

The algal leaf spot caused by Cephaleuros virescens O. Kunze is reported commonly occurring on Cinchona sp. in the East Indies. However, while this leaf spot has been mentioned on many hosts in the Western Hemisphere, it apparently has not been reported previously on cinchona. In regions where environmental conditions are favorable, Cephaleuros virescens has been found as a leaf spot on the Ledger form of Cinchona officinalis L. and on C. succirubra Pavon in Guatemala. In Peru the writers also noted it on the Ledger form of C. officinalis and in Colombia on C. pubescens Vahl. This leaf spot did not appear to be of economic importance at any of the places where it was found by the writers.

OCCURRENCE OF CINCHONA ROOT ROTS IN THE AMERICAS

Bowen S. Crandall[1] and William C. Davis[1]

The reawakening of interest in cinchona culture in the Western Hemisphere has focused attention on the diseases attacking Cinchona. Heretofore, little or no work has been done on the disease problems of cinchona in this Hemisphere. Investigations must be conducted to determine whether diseases are native or introduced. Native diseases may be more destructive now because of intensified planting of cinchona and may be highly pathogenic to introduced strains of cinchona. Native cinchona may be susceptible to introduced diseases.

As early as 1891 the root disease problem in Java was considered more serious than the pink disease (6). At that time the British in India and Ceylon also were having trouble with a similar root disease (6). In Java Cinchona pubescens Vahl was found to be comparatively resistant to root rot, while the Ledger variety of C. officinalis L. was found to be susceptible. Rant (7) in 1916 described a gray root rot in Java, which he associated with Rosellinia sp., and a year later stated (8) that C. robusta Trim. and the Ledger form of C. officinalis were especially susceptible to the white root fungus, Armillaria mellea Fr. A red root rot caused by Ganoderma pseudoferreum Wakef. and another due to Armillaria mellea Fr. have also been mentioned in Java and Sumatra (5). Armillaria mellea and Rosellinia were also reported causing root rot on cinchona (3) in the Belgian Congo. In Indo-China collar rot in both nurseries and plantations (1) was so serious below 1100 meters that the trees had to be exploited

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between 5 and 10 years after planting. The disease there was thought to be caused by a Fusarium.

After the grafting of Ledger tops on C. succirubra Pavon root stocks became a recognized control measure in Java against the root disease, numerous cases of root disease on Ledger grafts on C. succirubra roots were reported, proving that C. succirubra was attacked by the grey root fungus (2). An undesignated species of Phytophthora was reported from stripe canker in 1940 (1).

Collar rot caused by Rosellinia sp. and Fomes lamoensis Murr. has been reported (9) in India as killing 3-year-old trees. Thompson (10) in British Malaya was the first to report cinchona root rot caused by Phytophthora cinnamomi Rands.

Two unidentified root diseases have been reported from Puerto Rico (4). One of these has symptoms resembling that of the Java disease caused by the "gray root fungus". Root and collar rot of cinchona in the Western Hemisphere is a complex of diseases. Judging by the symptomatic expressions, a large number of these diseases are probably caused by Phytophthora species. Many of the causal organisms for this group of diseases in this hemisphere have not yet been established. In all cases examined by the writers infection is primarily in the cambium region regardless of whether the individual case involves root, collar, or graft union. Infected tissues in the early stages of the rot are chestnut brown in color. Leaf symptoms that were noted associated with this group of diseases consist of some reduction in density of foliage, very slight epinasty, increase in red coloration, and occasionally some reduction in size. As death approaches the tree gradually loses its leaves.

In Guatemala as in Java a common practice is to graft the Ledger variety of C. officinalis on C. succirubra root stock. This practice is followed because of the comparatively slow growth of C. officinalis variety ledgeriana when grown on its own roots. Though positive identification and specific proof of pathogenicity are lacking for cinchona root rot diseases in Guatemala, a few positive generalizations can be drawn. In existing plantations C. succirubra appears quite resistant to endemic and established root rots. It is to be noted, however, that though the C. succirubra root stock is itself quite resistant, yet it sometimes serves as a conductor for the causal fungus of at least one root rot disease. Observed plants attacked by this root rot disease had thin foliage, with the leaves distinctly reddish and somewhat smaller than those of nearby healthy trees. Fifteen of the affected trees ranging from 4 to 8 years of age were studied either in the field or dug up and removed to the laboratory for more detailed examination. In the root stock in every grafted plant but one, a very narrow streak, often not more than 1 mm in width, of infected cambial tissue was found to extend between a root lesion and the graft union. In the Ledger scion and connected through the graft union with the infected streak in the root stock was a girdling lesion. These lesions were in the shape of cankers that developed more rapidly in the vertical than in the horizontal plane. Some of these cankers extended up the trunk of the scion as much as 3 feet before complete girdling just above the graft union occurred. In some cases cankers with the same characteristics developed where over-deep planting brought the scion tissues in direct contact with the soil. The Ledger variety of C. officinalis growing on

its own roots was also found attacked by this disease. This canker disease of Ledger scions appeared to have been caused by a soil-borne parasite that is probably also an active root rot on susceptible root stock. The possibility of selecting a root stock totally resistant to the organism causing this disease was indicated by a small degree of variability in the resistance of various infected root stocks.

In Peru a 10-year-old planting of the Ledger variety of C. officinalis has shown an apparent root disease mortality of about 20%. The rot apparently starts in the below-ground collar region, either on the main roots or at the base of the trunk. Cambial tissue as high as 8 to 10 inches above the ground line is often invaded before the tree is girdled and death results. In this case the parasite appears to be quite virulent. At some locations in the planting as many as 3 replants have been killed by root rot. Here as in Guatemala some trees appear to be naturally resistant. On the basis of the growth curve for the planting, losses and slowing down in growth occur principally after the seventh year. Chemical analysis of the bark of the trees in this plantation shows that the quinine content of their bark is approaching its maximum concentration at about the seventh year. Consequently, even a moderate degree of resistance might make it economically feasible to grow trees to harvesting age.

In the deep sharp valleys of the eastern slopes of the Andes in the Department of La Paz in Bolivia, field plantings of the Calisaya form of C. officinalis grown from locally collected seed of wild trees have suffered an alarming mortality from an apparent root disease. In several cases the entire planting has been wiped out. Examinations in 4 separate planting areas strongly indicated faulty field plant practices to be a contributing factor in the loss of the trees. The young plants were placed in the bottom of holes with a diameter of 5 to 6 inches and a depth of about 1 1/2 feet. The drowning of the roots in the bottom of these holes during the rainy season and the inability of the roots to make normal growth in the impervious clay subsoil apparently allowed rot fungi to gain entry. The introduction of bits of infected cinchona roots into mature unripe wild pineapples yielded cultures of a fungus the hyphal characteristics of which were those of a Phytophthora. Experimental work with Phytophthora root rot on other hosts by various workers has demonstrated that otherwise resistant hosts may be infected by artificial inoculation if the root system is immersed in water for as short a period as 2 days at the time of inoculation.

Wild specimens of this host have some rot lesions on their roots but are otherwise healthy. It appears likely, therefore, that, with selection of root rot resistant Calisaya and modification of current field planting methods, plantation losses could be materially reduced.

A dry root rot was observed in a small wild stand of C. pubescens in the vicinity of Piedrancha (Departamento de Nariño), Colombia, but did not appear to be serious.

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PHLOEM NECROSIS OF ELMS IN MISSOURI

T. W. Bretz

During the summer months reports have come in to various individuals at the University of Missouri concerning the death of elm trees in various sections of the State. Occasionally specimens, taken from the aerial portions of the trees, accompanied requests for information regarding the cause of the trouble. These specimens however, showed nothing more than a yellowing of the foliage, which might result from a number of different causes. In the latter part of August, Mr. J. Allison Denning, State Entomologist, reported that his examination of affected trees in the St. Louis and Kansas City areas led him to suspect that Phloem Necrosis (a

Virus disease) was responsible for the killing. Although this disease had been reported as present in southeastern Missouri by Swingle[1], it had not, apparently, caused sufficient damage to have attracted much attention in previous seasons. Inasmuch as the death of elms in the above named cities apparently had attained epiphytotic proportions, it was considered desirable to make a survey of these areas.

In St. Louis, elm trees have been dying at an unusually high rate during the summer in one residential section in the southwestern portion of the city. This area was surveyed with Mr. Denning. The trees affected are principally the vase and Moline types of the American elm, approximately 10 to 15 years old. In this single sub-division, about 150 trees were observed in all stages of decline, from early wilting of the foliage to complete defoliation. From a few to practically all of the trees along both sides of certain streets were affected. In one instance only one healthy tree remained in an original planting of approximately 50 trees in one city block. Along another drive, 22 out of 52 trees planted were diseased. Trees showing all degrees of defoliation were examined at the bases of the trunks and on the buttress roots. In every instance a "butterscotch" yellow discoloration of the inner phloem (described by Swingle as characteristic of Phloem Necrosis) was present and in numerous instances, a faint but distinct odor of wintergreen could be detected in the affected tissues, another characteristic ascribed to this disease. There seems to be little doubt, therefore, on the basis of the symptoms observed in the aerial portions of the trees, combined with those affecting the phloem at the tree bases, that Phloem Necrosis is responsible for the death of many elm trees in this area. Isolated groups of a few affected trees were also noted in other, outlying parts of southwestern St. Louis County.

A subsequent survey was made of the Kansas City area (Jackson County) with Mr. Denning and Mr. Lester Davis, Assistant State Entomologist. During a portion of this survey, Mr. J. V. Lewis, Superintendent of Parks and Mr. Hugh O'Connell, Superintendent of Swope Park Nursery, Kansas City, Missouri, assisted in finding locations of diseased elms. In this area the native American elm is planted almost exclusively for shade-tree purposes. On the survey, which covered much of the park and residential area of the city, from 75 to 100 trees were observed which had been killed or were dying. Trees examined in the various locations showed symptoms typical of the Phloem Necrosis disease. Planted, as well as "wild" trees were noted to be affected, their trunks ranging is size from 4 inches to 3 1/2 feet in diameter. The number of trees affected in any single location ranged from one to 12 or 15.

During the week ending September 16, dying elm trees showing typical Phloem Necrosis symptoms were observed in a fence-row, approximately 5 miles northwest of Marshall, in Saline County. About 8 trees in a single location appeared to be affected and showed various stages in the development of the disease.

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[1] Swingle, R. U. Phloem necrosis, a virus disease of the American elm. U. S. Dept. Agr. Circ. 640, p. 1-8. 1942.

Attention was called to a dying elm in Booneville, which, it was thought, might be dying from Phloem Necrosis. No evidence of Phloem Necrosis was present, but the mycelium and rhizomorphs of a fungus identified as Armillaria mellea, were found around the entire circumference of the base of the tree under the dead bark. It seems probable that this organism may, at least in part, have been a factor contributing to the death of the tree.

Known locations of Phloem-Necrosis affected trees other than those already mentioned are Jefferson City (Cole County) and southern Clay County. EMERGENCY PLANT DISEASE PREVENTION PROJECT.

DYING OF ELMS IN INDIANA

J. S. Tidd

Reports of dead and dying elms to the south of Indianapolis prompted a survey during the week ending September 16, to ascertain the areas in which such diseased trees were to be found.

In Fountain County near Veedersburg dead elms were first observed. This area is just east of Danville, Illinois in which city many elms of all ages are either dead or dying, and just south of Warren County, Indiana, where dead elms have been observed.

No more dead elms were observed until reaching Greencastle, in Putnam County. Here, at least 75% of 1500 to 2000 large and small elms in this town and outlying areas were either dead or dying. Occasional dead elms were seen in fields south of Greencastle and eastward to and in Franklin in Johnson County. At Shelbyville in Shelby County, dead and dying elms were present, probably 33% in one area just south of this city having recently died.

Along a route north of Shelbyville to Greenfield and Pendleton, thence northwest to Lafayette, no dead elms were found although trees with sparse foliage, prematurely yellow, were observed.

Reports given by D. L. Grimes, Putnam County Agent, and by home owners, were to the effect that elms in the Greencastle area had been dying for the past several years--along the city streets, in fields, and in wet areas. Briefly, the external symptoms resemble those described for the Dutch elm disease, Dothiorella (Cephalosporium) wilt, Verticillium wilt, and Phloem Necrosis. Because the writer could find no evidence of sapwood discoloration, such as brown streaking or flecking, but did obtain a dark brown discoloration of the inner phloem next the cambial region, which apparently was not to be observed the first minute or two after cutting a small branch of a healthy tree, Phloem Necrosis (Virus) is suspected as the cause of the death of many of the elms in this area. The wintergreen odor referred to as diagnostic for Phloem Necrosis could not, however, be obtained either from increment borings or pieces of bark from buttress roots.

As various workers have pointed out, the external and internal symptoms of the 3 fungous diseases referred to above so closely resemble one another that positive identification as to the causal organism should be obtained from culturing. For this reason specimens were obtained from the vicinity

of Greencastle and Shelbyville. Positive or even negative culture results from these may give some clue as to the cause of the dying of elms in these areas.

An attempt to further determine the northern limits in Indiana of dead and dying elms was also made during the following week. Only in the town of Liberty in Union County at the extreme eastern part of the State were dead and dying elms observed. From Liberty west to Rushville and northward no other dead elms were seen. Liberty is almost due east of Shelbyville, Franklin, and Greencastle where as reported above, elms are dying in large numbers. Dr. R. M. Caldwell of the Purdue Agricultural Experiment Station has also reported observing dead elms in the vicinity of Parkersburg.

As indicated above, Phloem Necrosis is suspected as being the cause. It is interesting to note the way this disease is apparently localized in various areas across the State from Liberty to Greencastle, thence northwest to Warren County, and whether in future years there will be further outbreaks in isolated localities further to the north in Indiana.

EMERGENCY PLANT DISEASE PREVENTION PROJECT.

FRUIT DISEASES IN OKLAHOMA

Howard W. Larsh

In company with Mr. Clyde A. Bower, Chief Inspector of the Oklahoma Department of Agriculture, an extensive survey was made of many of the important orchards throughout the State, August 14 to 30.

APPLE: Twenty-one orchards were surveyed consisting of approximately 1200 acres.

Blotch (Phyllosticta solitaria) was most prevalent on the varieties Ben Davis, Yellow Transparent, Red and Yellow Delicious. Twig, leaf, and fruit infections were observed on the variety Yellow Transparent, in a small orchard near Yale (Payne County). The incidence of the disease on the fruit, in this orchard, was considerably less as compared to last year. The most severely infected orchard was observed near Stilwell (Adair County). The variety Ben Davis was infected so severely that several trees died this year as a result of continuous devitalization. Nearly every branch, twig, leaf, and fruit was infected. The fruit was rendered unmarketable for eating or cooking purposes but was being sold to be used in the production of cider and vinegar.

Scab (Venturia inaequalis) occurred in some degree in nearly every orchard surveyed and especially on the more susceptible varieties. In Cherokee County an infection of nearly 80% occurred on the varieties Red and Yellow Delicious, and Jonathan. Red Delicious was the most severely infected variety, considering the State as a whole.

Bitter Rot (Glomerella cingulata) was well distributed in several of the orchards in the eastern section of the State. In 2 orchards considerable loss resulted from fruit infections. Although as many as 6 applications of 4-4-50 bordeaux mixture were applied to the infected trees, Bitter Rot was not controlled. From all indications this disease has again become a factor in the destruction of trees in eastern Oklahoma. Orchard

are in agreement that Bitter Rot has been quiescent for the past few years, only to become evident during the 1942 season, and to increase in virulence and destructiveness during the 1943 and 1944 seasons.

Black Rot or Frog-Eye Leaf Spot (Physalospora obtusa) caused slight to moderate defoliation in 4 orchards. Severe defoliation and yellowing of the leaves early in the growing season occurred in a large orchard in Delaware County, which would suggest that some reduction in yield may have resulted from this early infection. Fruit infections appeared in this orchard following mechanical injury and codling moth injury. Fruit infections, following codling moth damage, accounted for nearly all of the early rotted fruits. Frog-Eye Leaf Spot was the most prevalent leaf disease of apple encountered during this survey in all regions of the State. In most instances where yellowing of the foliage was apparent, it was due to Frog-Eye Leaf Spot.

Sooty Blotch (Gloeodes pomigena) occurred in several of the orchards; however, where the practice of polishing previous to packing was followed, it was difficult to find Sooty Blotch infections without close observations.

Flyspeck (Leptothyrium pomi) infections were observed in many of the orchards surveyed. The most severely infected fruit occurred near Tahlequah (Cherokee County). As with Sooty Blotch, the loss due to this fungus was negligible and most of the fruiting bodies were removed during the process of polishing.

Cedar Apple Rust (Gymnosporangium juniperi-virginianae) on leaves occurred in several orchards. In each instance only a light infection was observed. The most severely infected orchard was observed in Adair County where a small number of fruits were also affected.

Fireblight (Erwinia amylovora) was present in every apple area in the State. In some instances twigs were destroyed. In a planting of 4-year-old Yellow Transparent near Stilwell (Adair County, every tree had some twigs destroyed.

Fruit Rots (Aspergillus sp., Penicillium sp., and Rhizopus sp.). Fruits infected with such fungi were observed in every orchard surveyed. In most cases infection followed either mechanical or codling moth injuries, and the incidence of soft rots was light.

Blister Canker (Nummularia discreta) occurred in a single orchard in Payne County. Characteristic "nailhead" fruiting stromata were observed on 2 trees. Several other trees, in this orchard, had early symptoms of Blister Canker.

Root Rot (Armillaria mellea) had destroyed several trees in Cherokee County. Most of the infected trees were observed adjacent to wooded areas. Characteristic fan-shaped mycelium occurred in most instances; however, rhizomorphs were seldom observed.

Two Root Rots were observed on nursery stock, namely, Black Root Rot (Xylaria mali) and Texas Root Rot (Phymatotrichum omnivorum). In both cases the infections were limited to localized infected areas. Very little apparent damage was being done by Black Root Rot, but several trees had been destroyed by Texas Root Rot and several others were just beginning to show signs of being infected.

Russeting (Spray Injury). In every orchard in eastern Oklahoma, where sprays had been applied, moderate to severe russeting occurred.

Considerable damage resulted in most of the orchards due to one or more of the following insects: Codling Moth, Leafhopper, or Twig Borers.

PEACH: Approximately 1400 acres were surveyed.

Bacterial Spot (Xanthomonas pruni) continues to be the most severe disease of peach in Oklahoma. In most of the orchards slight to moderate defoliation had resulted from early infections. Fruit, twig, and leaf infections could be found in nearly every bearing orchard surveyed. A large commercial orchard (Adair County) that had been sprayed (following the recommendations presented in the spray schedule for peaches in Oklahoma) failed to produce many fruits free of Bacterial Spot.

Scab (Cladosporium carpophilum) occurred in every orchard surveyed during this period. Early maturing varieties were heavily infected in spite of attempted control by recommended spray procedures. Very little loss resulted from these infections; however, during those years when grade had to be made, a loss would have resulted.

Brown Rot (Monilinia fructicola) was observed in several orchards, although most growers took particular care in trying to eliminate this fungus from their orchards. In a small orchard in LeFlore County very large, late maturing Elberta fruits were rendered unmarketable due to a late attack by Brown Rot.

Crown Gall (Agrobacterium tumefaciens). Several trees near Idabel (McCurtain County) and Durant (Bryan County) were infected. A loss of 5% of the trees in a small orchard near Durant could be attributed primarily to this bacterium.

Root Rot (Armillaria mellea)-affected trees were observed near Tahlequah (Cherokee County). The most severely affected orchard was located adjacent to a wooded area.

Rootknot (Heterodera marioni) was observed in McCurtain and Bryan Counties. In a 3-year-old orchard near Idabel (McCurtain County) a loss of nearly 10% of the trees was observed. Many other trees, in this planting, were showing symptoms characteristic of Rootknot.

Mosaic (Virus) infected trees were observed in Bryan and Woods Counties. In a small home orchard near Colbert (Bryan County) at least 10 trees had symptoms characteristic of peach Mosaic.

PEAR: Approximately 15 acres were surveyed. In most of the instances the plantings consisted of only a few trees.

Blotch (Phyllosticta solitaria) was observed in several areas. The most severely infected tree occurred near Colbert (Bryan County); nearly every leaf, twig, and fruit was invaded.

Many trees were observed infected with Leaf Spot (Fabraea maculata), although in no instance was it causing any appreciable loss or defoliation. In a small orchard near Yale (Bryan County) every tree was infected.

Scab (Venturia pyrina) was prevalent and causing considerable damage in an orchard near Howe (LeFlore County).

Sooty Blotch (Gloeodes pomigena) occurred in several plantings during this season. The most severely infected orchard was observed in LeFlore County where it was impossible to find a fruit free from this disease.

Fireblight (Erwinia amylovora) was observed in nearly every orchard. In Choctaw, LeFlore, and Payne Counties several trees were infected and in some instances one or two trees had been killed.

PLUM: Approximately 10 acres surveyed.
Bacterial Spot (Xanthomonas pruni) occurred in all of the trees in a small planting near Stilwell (Adair County). Defoliation was not so severe in plum trees as in peaches. Brown Rot (Monilinia fructicola) caused a 100% loss of the fruit in a small planting near Stilwell. Black Knot (Dibotryon morbosum) was observed on 3 trees in McCurtain County.

CHERRY: Approximately 15 acres were surveyed. Leaf Spot (Coccomyces hiemalis) infections were beginning to cause slight to moderate defoliation in orchards near Noble (Cleveland County). Brown Rot (Monilinia fructicola) mummies were observed in nearly every tree surveyed. A loss of nearly 2% due to Brown Rot, was observed earlier in the season in the Noble area.

GRAPE: Approximately 25 acres were surveyed.
Black Rot (Guignardia bidwellii) was the most prevalent and destructive disease of grape observed. In vineyards in Cherokee, Grady, Cleveland, and Okmulgee Counties Black Rot was causing destruction of the fruits, stems, and leaves. A loss of nearly 50% of the fruit occurred in a small vineyard in Okmulgee County. Earlier in the growing season this disease was causing considerable loss to the growers; however, owing to the continuous dry, hot weather further development and spread of the disease has been prevented.
Anthracnose (Elisnoë ampelina) was observed in vineyards in Cherokee County. Very little reduction in yield resulted. Leaf and stem infections were prevalent in a small vineyard in Grady County, but adverse weather conditions prevented the spread of this fungus to the fruit.

BRAMBLES: Approximately 135 acres were surveyed.
Anthracnose (Elsinoë veneta) infected Boysen and Young dew berries were observed in plantings in Adair, Choctaw, Haskell, and Bryan Counties. In nearly every instance very little damage had resulted.
Leaf Spot was scattered through all plantings surveyed. In a small blackberry planting at Britton (Oklahoma County) considerable spotting of the leaves and slight defoliation could be attributed to Septoria rubi.
Crown Gall (Agrobacterium tumefaciens) was observed in 2 large plantings in Adair and Cherokee Counties and a smaller planting in Choctaw County. Nearly 10% of the plants were affected in a large acreage near Tahlequah (Cherokee County) and in a smaller planting near Hugo (Choctaw County).

STRAWBERRY: Approximately 225 acres were surveyed.
Leaf Spot (Mycosphaerella fragariae) occurred in Adair, Cherokee, and Delaware Counties. A reduction of nearly 30% of the leaf surface occurred in a small planting near Stilwell (Adair County). A large planting of the variety Blakemore was infected to the extent that slight defoliation of the infected leaflets was observed at Colcord in Delaware County.
Scorch (Diplocarpon earliana) was present in several of the plantings in Adair County, causing a reduction of 20% in the leaf surface, (Aroma Variety). A similar loss was observed in a small planting in Cherokee County.
Plants having symptoms typical of Leaf Blight (Dendrophoma obscurans) were collected in 2 old plantings in Delaware County.
EMERGENCY PLANT DISEASE PREVENTION PROJECT.

A DISEASE OF GUAYULE CAUSED BY SCLEROTIUM BATATICOLA

John T. Presley

Sclerotium bataticola Taub. caused appreciable loss in 2-year-old dry-land guayule plantings at Pearsall, Texas during July and August, 1944. Surveys of these plantings were made on July 31 and August 22 to determine the number of infected plants. On these dates diseased plants could be found with only one branch dead, some with half the branches dead and many with all the branches dead. Dark brown, sunken lesions were noted at or near the ground line on diseased plants. When the lesion completely encircled the crown the top died but the root system remained sound for some time. Platings from the margins of lesions and from discolored wood yielded S. bataticola in every case, hence this fungus is designated as the cause of the disease.

S. bataticola has been isolated from diseased guayule at various times since 1942 in the course of disease investigations carried on by the Guayule Research Project, but not until the outbreak herein described has it been considered as a pathogen of any importance on guayule. The abnormally hot, dry weather during July and August in south Texas apparently favored the development of the disease.

Field counts made in July indicated that as many as 6.6% of the plants in the 40-inch spacing were affected, and that in August this had increased to 10.3%. Complete results of the counts in the 10-, 20-, and 40-inch spacings are given in the Table.

Sclerotium bataticola diseased plants in a guayule field spacing experiment at Pearsall,[a] Texas, 1944

Date	Spacing	Plants Counted	Diseased Plants				
			Infected[b]		Dead		Total
	Inches	Number	Number	Percent	Number	Percent	Percent
July 31	10	8417	68	0.8	119	1.4	2.2
	20	3990	59	1.5	93	2.3	3.8
	40	2099	65	3.1	74	3.5	6.6
August 22	10	6436	73	1.1	346	5.4	6.5
	20	2895	63	2.1	197	6.8	8.9
	40	2099	77	3.6	141	6.7	10.3

[a] Experiment conducted by Agronomy Division, Guayule Research Project.

[b] A plant was classified as infected if at least one branch remained alive.

GUAYULE RESEARCH PROJECT, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING.

DISEASES OF CIGAR-WRAPPER TOBACCO IN FLORIDA, 1944

Randall R. Kincaid

Downy Mildew (Peronospora tabacina) appeared fairly early in the 1944 plant bed season, and caused moderate damage in a few beds. Fermate dust (20%, applied twice a week from 5 to 12 ounces per 100 square yards per application) gave effective control in commercial as well as experimental beds. The dust treatment required more Fermate but much less labor for application than spraying, and appeared to be the most satisfactory treatment yet developed for cigar-wrapper tobacco plant beds.

A Non-parasitic Damping-Off of small tobacco seedlings was observed in several plant beds in 1944 and previously. The symptoms were more or less complete decay of the roots, and stunting and yellowing but not decay of the stems and leaves. Severely affected seedlings remained alive for several days and finally dried up. It was closely associated with an accumulation of nitrite, ranging from about 5 to 45 parts of nitrous nitrogen per million parts of dry soil. As the nitrite disappeared from the soil, seedlings which survived produced new roots and made apparently normal growth. This type of injury appeared to be common; occasionally quite serious, especially in steam sterilized beds.

A. L. Taylor reported (PDR 28 (18): 602-604, June 22, 1944) finding at this Station Meadow Nematodes (Pratylenchus pratensis) associated with abnormally coarse roots similar to those shown (Fig. 7) in Fla. Agr. Exp. Sta. Bull. 392, 1943. This abnormality, for which the name, "Coarse Root", is suggested, was prevalent in all fields at this Station, and was observed in several others. The affected portion of the root systems varied from a trace to almost 100%. Further examinations verified Taylor's observation of the presence of Meadow Nematodes in the brownish lesions on coarse roots, and also in the soil adhering to such roots. Further study will be required to determine whether these nematodes are the cause of "Coarse Root". Since coarse roots are often almost completely devoid of lateral rootlets when examined at the end of the harvesting season, the absorptive area of such roots must be practically nil. The amount of damage to the plant attributable to this condition would depend largely on the time when the rootlets were destroyed; this remains to be investigated.

Granville Wilt (Bacterium solanacearum) was identified in this area for the first time in many years. In the small field where the disease occurred, W. H. Sachs of the du Pont Company was conducting a test with Uramon, applied in October, 1943. On May 26, 1944, two months after the crop was transplanted, the average percentage of wilted plants was as follows: No Uramon, 27%; 1000 pounds per acre, 7%; 2000 pounds, 2%; 1000 pounds Uramon and 1000 pounds basic slag, 10%. No other case of Granville Wilt was observed.

NORTH FLORIDA EXPERIMENT STATION, QUINCY, FLORIDA

COTTON DISEASES IN OKLAHOMA AND ARKANSAS

Howard W. Larsh

OKLAHOMA: Approximately 1400 acres were surveyed during the period August 14 to 30.

Bacterial Blight (Xanthomonas malvacearum) was well distributed in the cotton growing counties of the State. In most instances very early infections occurred, attacking the cotyledons and the first true leaves. Favorable weather conditions, which prevailed during April and May, aided in the development and spread of leaf spot. Moderate defoliation and extensive yellowing and spotting of the remaining leaves caused considerable reduction in yield in a planting near Spiro (LeFlore County). In some areas, however, even though early infections were prevalent, adverse growing conditions prevented the further development and spread of the disease.

Leaf Spots (Cercospora sp. and Alternaria sp.) occurred in many plantings. In most of the attacked plantings infection came rather late, following nutritional and climatological adversities. Several plantings between Beggs and Okmulgee (Okmulgee County) had severe leaf spotting due to these fungi.

Fusarium Wilt (Fusarium [oxysporum f.] vasinfectum) was evident in only 3 localities during this period. A few plants were beginning to show typical symptoms of wilt near Holdenville (Hughes County). Near Rush Springs (Grady County) a loss of 5% occurred in a 10-acre field. The most severe loss was in the Arkansas River "bottom land" near Spiro where at least 10% of the plants were infected with Wilt.

Verticillium Wilt (Verticillium albo-atrum)-infected plants were observed in Johnston and Tillman Counties. In each affected region wilt was localized and only a few plants were dying. Less than 1% of the plants in each area were infected and every diseased plant was heavily laden with prematurely ripened bolls.

Root Rot (Phymatotrichum omnivorum) was observed in 8 counties causing considerable loss. The most severely affected region was from Grandfield northwest to Frederick and continuing slightly northeast nearly to Snyder. Several fields in this area had losses ranging from less than 5 to as much as 35.

Rust (Potassium Deficiency). Plants having typical symptoms of potash hunger were observed in several plantings. Many of these plantings were located in counties where Fusarium Wilt had been reported in previous years.

Boll Rots (Xanthomonas malvacearum, Glomerella gossypii, Alternaria sp., etc.). An extensive collection was made of Boll Rots throughout the cotton growing region. Collections were made in 27 counties and sent to Dr. Ray for isolation and identification of the causal organisms. This year, due to the cool, damp early growing season, Boll Rots caused considerable loss to many cotton growers. Very few fields in the southeastern tier of cotton growing counties were free of Boll Rots. In several instances 65 to 85% of the bolls were infected by various organisms. In a 25-acre planting in the Arkansas River "bottom land" near Spiro, at least 95% of the bolls had been attacked by boll rotting organisms. Boll Rots were less severe in the southwestern and central counties than in the southeastern counties; however, the inoculum is present and with the recent rains there is a possibility that boll rots may increase. Dr. Ray will include the results

from these and his own collections for publication in a future number of the Plant Disease Reporter.

ARKANSAS: Approximately 1400 acres were surveyed in Arkansas during the period September 5 to 18.

Angular Leaf Spot (Xanthomonas malvacearum) remains scattered throughout most of the plantings. In nearly every case, however, very little loss resulted from these early infections. Further development and spread was prevented, owing to the adverse growing conditions prevailing later in the season. The most severely infected planting located near Dumas (Desha County), reported in a previous summary, had at least 30% defoliation and severe yellowing resulting from leaf spot.

Cotton Boll Rots occurred in varying amounts in many plantings. Very few fields had infections which compared with the percentage observed in Oklahoma.

Cercospora and Alternaria Leaf Spots were prevalent as observed during this survey, in nearly every instance attacking plants in a low state of vigor or showing the effects of the continuous drought. In a 50-acre planting near Osceola (Mississippi County), however, Alternaria had infected nearly every plant; nevertheless, the foliage was green and the plants appeared to be in a vigorous state of growth.

Fusarium Wilt had increased considerably during the past month. Observations made from August 2 to 8 resulted in locating Wilt infections of any consequence only between Wabbeseka and Altheimer (Jefferson County). However, from September 8 to 14, Wilt was observed in 21 counties, infections varying from a trace to a field in which 85% of the plants were infected. The most severely affected region occurred in Jefferson and northern Lincoln Counties. It was not at all uncommon to see fields in this area with plants darkened and wilted to the extent of 65 to 85%. It was difficult to estimate the actual loss, since in one of the severely wilted plantings, plants that had been killed by this fungus had produced from 12 to 18 prematurely ripened bolls.

In many of the 21 counties in which wilt was observed during this survey, no visible symptoms were observed during the first few days in August. This would suggest that the infected plants did not show signs of wilting until after the rains in late August and early September.

The reporting of finding Wilt in 21 counties is not to suggest that this constitutes the distribution of this disease during the year of 1944 in the State of Arkansas. It merely means that infected fields in these counties were observed on this trip; however, the principal cotton growing counties were surveyed.

Verticillium Wilt (Verticillium albo-atrum) was observed in Little River, Mississippi, and St. Francis Counties. The infections occurred in localized areas in varying amounts. The most severely infected fields occurred on "buck-shot" land near Hughes (St. Francis County), where an infection of at least 30% was observed.

Phymatotrichum Root Rot was limited to an area in southern Little River County. The amount of loss fluctuated in every planting, varying from a trace to nearly 5%. Root rot affected fields occurred from immediately south of the town of Foreman to the Red River.

Cotton plantings having symptoms characterisitic of Potash Hunger were widespread. Many growers were quite concerned this year regarding "Rust" since many of their fields showed severe signs of Potassium Deficiency.

The most obvious cause for leaf destruction throughout the cotton growing counties was the cotton leafworm. Many plantings were completely stripped of their leaves by this insect. Fortunately, in most instances, the greatest ravage was done late in the growing season.

Many fields of cotton were observed in which red spider infested areas could be seen.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

OBSERVATIONS ON MISSISSIPPI TOMATO DISEASES IN SEEDBED AND FIELD, AND IN HANDLING AND MARKETING OPERATIONS[1]

H. H. Foster[2] and L. P. McColloch[3]

The growing of tomatoes in Mississippi for the "green wrapped" trade is largely confined to Copiah and parts of adjoining Counties. During the 1944 season the industry suffered severe losses due, in part, to the abundance and variety of diseases present. For some growers it was a disastrous season and for buyers and shippers in general it was far from satisfactory.

Weather conditions until about June 15, which was midseason in 1944 for "green wrapped" tomato production in Mississippi, favored the spread and development of several diseases in epidemic proportions. In late February, during the normal period for transplanting from seedbed to cold frame, the rainfall was high and the temperature in general was cool. Consequently soil preparation in cold frames was delayed and often poorly done. In addition, plants were frequently rather old and spindling when transplanted. Heavy beating rains continued at frequent intervals in late March and early April during the field transplanting period, frequently delaying the transplanting; and rain and hail during April injured or killed many young plants. This necessitated considerable resetting and left many fields with poor, non-uniform stands.

The early blight fungus, Alternaria solani (Ell. & Mart.) Jones & Grout, caused considerable damping-off of the young plants in the seedbeds and coldframes and in the field following transplanting. Further injuries on older plants were frequently observed in the form of stem girdling and leaf spotting, and in many cases the stem injuries caused the plants to

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1 Contribution from the Truck Crops Branch Station, Mississippi Agricultural Experiment Station, State College, Miss. Published with the approval of the Director, Mississippi Agricultural Experiment Station. Paper No. 89, New Series. In cooperation with the Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture, Beltsville, Maryland.

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3 Assistant plant pathologist, Division of Fruit and Vegetable Crops and Diseases, Beltsville, Md. Reporting on diseases in the handling and marketing of Mississippi tomatoes.

die. This disease appeared to be more prevalent on young plants south and east of Hazlehurst than in the Crystal Springs area. Only an occasional infected plant was observed at the Mississippi Truck Crops Station.

Alternaria solani was found to cause extensive foliage blight throughout the county. Blighted foliage could be seen in practically all fields early in the shipping season, and in many fields the foliage was killed well up the plant before the shipping season opened. Such serious defoliation weakened the plants and left the fruits exposed to sun scald. At the Truck Crops Station both A. solani and Septoria lycopersici Speg. were found to be sporulating abundantly on the same foliage, but it is not known to what extent S. lycopersici was a factor in leaf blight throughout the area. Tomatoes following tomatoes appeared to be infected earlier and somewhat more severely than plants set in rotation with other crops. Many growers consider leaf blights as of no economic importance. This year, however, foliage blights, along with other diseases, caused considerable loss and definitely were of commercial importance.

Alternaria solani is capable of causing decay in ripe tomatoes, but none was observed in the test lots which were stored until firm ripe.

The late blight fungus, Phytophthora infestans (Mont.) DeBary, was found on tomatoes in fields principally north and west of Crystal Springs. It was not observed on tomatoes in the field in the Hazlehurst area or at the Truck Crops Station. In the affected area it was first observed in May during a prolonged period of cool, rainy weather. At the same time, potatoes in nearby plantings were frequently found to be affected by this fungus. At the Truck Crops Station 11 varieties of potatoes were severely attacked by P. infestans. The potato plots adjoined and partly surrounded a tomato experimental plot with approximately 100 varieties and lines under observation. Late blight infection developed in the potatoes during late April, but no blight was observed on any of the tomato lines at the Truck Crops Station during the entire season. This suggests that the fungus may have been present in certain biologic forms.

Late blight, wherever present, was highly destructive to the tomato crop, infecting both foliage and fruit. In certain fields an estimated 50% of the fruit was lost because of this disease alone. With higher temperature and decreased precipitation during June, the disease gradually became inactive. Observations made on tomato test lots shipped on June 13, indicated that very few fruits were arriving on the market with late blight rot. A few fruits from the Hazlehurst area were found to be infected with this fungus.

Forbes and Person (PDR 28(18): 591, 1944) reported Phytophthora infestans as occurring on tomatoes in Louisiana, probably for the first time. Some Mississippi growers and shippers state that the same disease was present on tomatoes in 1939 and possibly earlier. It seems quite probable that late blight has previously occurred on tomatoes in Mississippi but on a less destructive scale.

Bacterial Spot, caused by Xanthomonas vesicatoria (Doidge) Dowson (Bacterium vesicatorium Doidge), was observed on large green tomatoes at harvest time. This disease appeared to be rather prevalent in certain plots at the Truck Crops Station, but no difference in varietal susceptibility or resistance was observed. Frequently diseased fruits were found

with unusually large spots not unlike those characteristic of the "nail-head" disease caused by Alternaria tomato (Cke.) Weber. Upon microscopic examination, however, such lesions proved to be bacterial spot. The most serious development of the enlarged, bacterial spot was observed in a field where the plants were stunted and had been seriously attacked by early blight (Alternaria solani).

More fruits were found with numerous, small, speck-like blemishes than with typical bacterial spot lesions. At the time, no effort was made to separate these 2 kinds of blemishes, but it is now believed that the speck-lesion was bacterial speck caused by Bacterium punctulans Bryan.

Growers usually discarded the more severely spotted fruit when picking for market. The immediate loss to the grower was considered less than the losses incurred from the blight-inducing fungi. It should be pointed out, however, that fruit with the bacterial speck type of disease was frequently included in the commercial pack, and this was one of the reasons for grading the fruit no higher than 75 to 85% U. S. No. 1.

Southern stem blight, caused by Sclerotium rolfsii Sacc., was observed in many tomato fields. This fungus may attack all parts of the plant, including fruit that touches the soil. During the past season the percentage of loss on plants or fruit in any one field did not appear great. This disease, however, is widely distributed throughout the South not only on tomatoes but also on most truck and summer legume crops. There is little doubt that southern blight must be classed as a disease of economic importance on tomato in Mississippi.

Fruit decay caused by Sclerotium rolfsii is rarely encountered on the market, and none was observed during the current season, either in shipping tests or on the Washington, D. C., Market.

Mosaic (virus) was occasionally observed in tomato fields, but it was of minor importance. While other diseases were of serious proportions, mosaic appeared definitely less prevalent than in 1943.

It has been pointed out that cool, rainy weather during the growing season favored the development of most field diseases. The shipping of "green wrapped" tomatoes started on June 5, with very immature fruits which reached most markets in nearly 100% green condition. The losses encountered in the post-harvest handling occurred for the most part during the ripening period, and the sum-total of decay from all causes was of serious proportions. The arrival condition on the Washington market was good during the first half of the shipping season when the vines were vigorous and the tomatoes were harvested decidedly immature. Of the 17 cars received on this market, Federal inspection was requested for 4 because of obvious decay when the cars were opened (Table 1). All of these cars were shipped late in the harvest season with fruits more mature than in the beginning, and from weakened vines.

On June 13, experimental shipments were made by including 10 test lugs of tomatoes in each of 2 solid carloads. These cars moved under refrigeration service, one to Chicago and the other to Washington, D. C., where the test packages were recovered and the fruit observed under ripening conditions until it became firm ripe (Table 2).

The fruits were found to show an unusual amount of mechanical injury which might be corrected by more careful handling in the field and in grading. Abrasions caused by the picking containers and sand scarring ap-

Table 1. Fruit condition found in the 4 cars of tomatoes inspected

Table 1. Fruit condition found in the 4 cars of tomatoes inspected[4]

Date received	Degree of ripeness			Decay notes		
	Green	Turning	Firm ripe	Range in decay	Average decay	Cause of decay
	Percent	Percent	Percent	Percent	Percent	Percent
6-22-44	5	50	30	5-22	15	Bacterial soft rot
6-29-44	35	45	17	1-10	3	do.
6-29-44	33	35	25	1-20	7	do.
6-29-44	50	35	10	1-12	4	do.

Table 2. Results on shipping tests on Mississippi "green wrapped" tomatoes.

Market	Total fruit examined	Days in transit	Additional ripening period	Fruits showing mechanical injury	Bacterial soft rot	Fusarium rot	Late blight rot	Rhizopus rot	Phoma rot	Total rot
			(days)	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Washington, D.C.	932	6	9	54.8	1.0	1.2	0.2	0.1	28.3	30.8

4 Data furnished by Herbert Graff, Fruit and Vegetable Branch, Office of Distribution, War Food Administration.

peared to be important factors. By the time the fruits were firm ripe, Phoma destructiva Plowr. had developed one or more lesions on a high percentage of the wounded fruit. As a rule, wounds that were not the seat of active Phoma rot were discolored and sunken, further increasing the loss through reduced sales value.

MISSISSIPPI AGRICULTURAL EXPERIMENT STATION AND U.S. DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES.